SUMMARY

The U.S. Department of Energy (DOE), National Nuclear Security Administration, is issuing this special environmental analysis (SEA) to document its assessment of impacts associated with emergency activities conducted at Los Alamos National Laboratory (LANL), Los Alamos County, New Mexico, in response to major disaster conditions caused by the recent wildfire known as the Cerro Grande Fire. This wildfire burned about 7,650[1] acres (ac) (3,061 hectares [ha]) within the boundaries of LANL and about an additional 35,500 ac (14,200 ha) in neighboring areas. DOE's emergency response to the threat of this fire began with certain preventative actions undertaken immediately before the wildfire entered LANL boundaries in early May 2000. DOE's subsequent actions include those taken to suppress the fire while it burned within LANL boundaries, as well as post-fire activities taken to address the extreme potential for erosion and flood damage at LANL and properties downstream from the facility.

As a result of this wildfire event, DOE identified the need to take actions on an emergency basis to protect human life and property. DOE considered that its actions should not just be protective of the lives of its employees, contractors, and subcontractors, but also the lives of all people living and working in the LANL region. DOE also considered that its actions should not just protect property belonging to the U.S. Government, but also the properties of neighboring and downstream landowners and residents. These end goals were approached through direct fire suppression and fire control actions; through the subsequent restoration of LANL facilities and structures to accommodate the resumption of human occupancy; and through a wide variety of actions undertaken to reduce the potential for significant storm water flood damage, including revegetation efforts and the development of constructed storm water control features. This SEA discusses all of these actions in detail in later sections.

DOE would normally prepare an environmental impact statement (EIS) in compliance with the *National Environmental Policy Act of 1969* (NEPA), as amended, to analyze potentially significant beneficial or adverse impacts that could occur if a proposed action(s) was implemented. However, because of the urgent nature of the actions required of DOE to address the effects of the Cerro Grande Fire as it burned over LANL and the need for immediate post-fire recovery and protective actions, DOE had to act immediately. DOE was, therefore, unable to comply with NEPA in the usual manner. DOE invoked the Council on Environmental Quality's emergencies provision of its NEPA Implementing Regulations (40 CFR Part 1506.11) and the emergency circumstances provision of DOE's own NEPA implementing regulations (10 CFR Part 1021.343(a)).

The time frame encompassed by this SEA is from the initiation of fire control measures in the first week of May 2000 until the end of November 2000. The reason for the

[1] This number of acres is an estimate based on data derived from the Burned Area Emergency Rehabilitation (BAER) Team Report (BAER 2000). It does not include DOE-administered lands in Rendija Canyon since these are not part of LANL. Any differences in acres affected among the BAER Report, other published sources, and this document are the result of data entry variations or rounding differences and are not intended to indicate significant differences.

extended time frame is that rain typically falls in Los Alamos County from about June through October, with over half of the annual rainfall amounts usually occurring during the months of July and August. Depending upon actual weather conditions, the completion of some of the activities planned for wetland and floodplain locations might be delayed until the rainy season has abated and site conditions allow the work to proceed to completion. Additionally, after review of actual rain conditions, some additional work may be required to prepare the LANL facility for subsequent seasonal precipitation.

Decisions to undertake actions have already been made by DOE through a working team known as the LANL Emergency Rehabilitation Team (ERT). The ERT consists of teams from both the University of California (UC) (as the management and operations contractor for LANL) and the U.S. Army Corps of Engineers (USACE), working jointly in support of DOE. USACE worked under an Interagency Agreement with DOE to construct engineer-designed storm water control structures in the field (DEAI04-00AL79799). The ERT evaluated and estimated the impacts from the Cerro Grande Fire; identified and designed appropriate mitigation measures for fire, increased erosion, storm water runoff, and potential flood conditions; and implemented these measures to prevent further damage to people, property, and the environment.

Unlike an EIS produced in the course of routine NEPA compliance, this SEA does not include an impact assessment of alternative actions that DOE could have taken to meet its purpose and need for action. Nor does it include an assessment of the No-Action Alternative. Furthermore, DOE will not issue a formal record of decision (ROD) based on this SEA analysis. Actions not included in this SEA analysis will be the subject of other NEPA reviews and analyses. Specifically, certain actions (such as replacement of experimental equipment and construction of a new emergency operations center building) are expected to be proposed soon that may in some way relate to the Cerro Grande Fire event, but which are not necessary for the immediate protection of human life or property. DOE has adequate time in which to undertake the routine NEPA compliance process for these proposals.

This SEA does not include an analysis of the impacts that resulted from the Cerro Grande Fire itself. Fire impacts at LANL are to be documented in other reports. This SEA also does not address the potential impacts that could result from erosion and floods at LANL should these occur beyond the design function of the engineered structures installed at LANL and analyzed herein. In the event of such a flood(s), DOE will undertake action and compliance with NEPA and other applicable environmental laws as appropriate. Documentation necessary will be prepared as needed at the time of that event.

This SEA provides the reader with an assessment of the impacts that have resulted because of actions undertaken by DOE (or undertaken on the behalf of DOE by other parties at DOE's direction or with DOE funding) to address a major disaster emergency situation. The SEA includes descriptions of the actions, the resulting impacts from the actions, mitigation measures taken for these actions that render their impacts not significant or that lessen the adverse effect of the actions, and an analysis of cumulative impacts.

Fire suppression and control actions included actions taken within LANL boundaries and within a DOE-administered tract located in Rendija Canyon. Actions were undertaken by firefighters specializing in both facility and wildland fires. These firefighters were from various local and regional areas and represented a wide variety of city, county, state, federal, and pueblo government organizations as well as small communities and other neighborhood organizations. Most of these actions occurred over large areas at LANL. Soil-disturbing activities are discussed later by watershed. Activities undertaken during the fire suppression period involved numerous LANL-wide locations. At the peak of the firefighting efforts, a total of about 1,600 firefighters and 100 pieces of firefighting equipment were present in the LANL vicinity performing fire suppression activities.

Firefighters felled trees to remove the fire's fuel sources near buildings, structures (including aboveground utility lines such as electric lines and pole structures and gas mains), access roadways, and other locations where fuel removal was deemed necessary to facilitate the firefighting goals of life and property protection. To control the advance of the fire front, firefighters constructed numerous, narrow fuel breaks to remove fuel sources. The firefighters ignited several back fires once fuel breaks had been established if site conditions were favorable. Helicopters with underslung drop buckets flew close to the tree top level at LANL and neighboring areas and dropped water on the fire. Airplanes also dropped fire-retardant slurry on the forest in advance of the fire front. Fire retardants in the form of foams were applied by handheld applicators and by truck-mounted applicators to buildings and structures, especially within the LANL technical areas (TAs) located along Pajarito Road and adjacent roads.

Post-fire actions included actions taken to allow safe reoccupancy of LANL facilities; monitoring and assessment; establishment of staging areas; removal and stabilization of contaminants and other hazardous wastes and materials; erosion control; and storm water control. Most of these actions occurred over large areas at LANL. The larger storm water control projects and contaminant removal projects are discussed by watershed.

Additionally, for all post-fire actions that required soil-disturbing activities, the individual sites were subsequently recontoured and reseeded with appropriate site-specific seed mixes. Temporary soil erosion control measures, such as silt fences, were installed to protect the sites from storm water runon and runoff until seedlings have become established according to a Storm Water Pollution Prevention Plan that was developed for LANL actions and implemented. Activities employed a variety of standard practices such as spraying water, including use of water spray trucks, to suppress fugitive dust where necessary; restricting vehicles to established roads; restricting vehicle fueling practices to appropriately established sites away from arroyos or any drainage; removing the smallest amount of vegetation possible; limiting activities within wetlands to the extent possible; and prohibiting activities within flagged perimeters of archeological sites.

Many structures, such as transportainers, trailers, sheds, storage buildings, cooling towers, pump houses, and military shelters, were damaged or destroyed by the fire as it moved over LANL. A total of 40 structures were damaged beyond reasonable repair or destroyed outright. Structures were removed using conventional heavy equipment, such

as front-end loaders, which resulted in some soil disturbance. Debris was sampled for substances regulated under the *Resource Conservation and Recovery Act* and the *Toxic Substances Control Act*, radioactive material, and New Mexico Environment Department special waste constituents before their removal and disposal at permitted disposal sites. Recyclable nonradioactive and nonhazardous materials were segregated from waste materials as much as practicable.

Hazard trees[2] along LANL roads and those next to buildings, structures, parking areas, and walkways were cut and removed from the site. Tree cutting activities resulted in minor surface soil disturbance, primarily at the site of each tree during the tree removal process.

Air, surface water, groundwater, soil, and produce monitoring continued as part of the post-fire actions. Approximately 30 damaged air and surface water monitoring stations were repaired or replaced. Concrete bumpers and other protective barriers have been installed around groundwater monitoring wells and other monitoring devices, as necessary, to provide protection to these structures from potential floods and damage by floating debris. New rain and stream flow gauges were installed or relocated (less than 10) as needed to monitor for flood conditions. In addition, many canyons (Los Alamos, Pueblo, Pajarito, Water, Cañada del Buey, Sandia, Potrillo, and Mortandad) were investigated to determine the movement or transport of contaminants through alluvial groundwater, surface water, ash flow, and sediments.

Burned area vegetative rehabilitation for erosion control across LANL included contour raking, seeding by hand and by air, mulching, and hydromulching. Moderately and severely burned areas were contour raked to break up the soil surface and to redirect and reduce water flow. The ground disturbance from raking was limited to the first few inches of the soil's surface. After raking, the areas were seeded by hand, by mechanical spreaders, or by small, low-flying aircraft. After seeding, straw mulch was spread by hand or by mechanical straw blowers.

The installation or replacement of similar storm water control measures, known as best management practices (BMPs), was required to protect 91 potential contaminant release sites (PRSs) that had been burned. Seventy-seven PRSs outside the burned area were also evaluated for potential accelerated actions. Culvert and drainage area clean-out activities were performed at all of the low-lying areas at LANL where storm water runoff was expected and where any inadvertent ponding of storm water might be expected from debris damming. Various flood damage control measures were installed to provide protection to electric power pole structures and other utility structures (such as electric substations, gas lines, water lines, wells and chlorination stations, sewage lift stations, and telephone and communication structures).

USACE undertook seven post-fire construction actions (summarized in Table S.1) according to stringent DOE and USACE design and construction requirements. Various

[2] Hazard trees are those that have been damaged and are a physical hazard to personnel or property.

material, work practices, and regulatory compliance standards were applied to the construction actions as well.

TABLE S.1—*U.S. Army Corps of Engineers Fire Rehabilitation Actions*

Title	Task Description	Area Impacted (ac/ha)
Weir and Sediment Trap in Los Alamos Canyon	Construct a rock gabion low-head weir structure in Los Alamos Canyon above the State Road (SR) 4 intersection with SR 502. The weir will be 10 feet (ft) (3 meters [m]) above grade and located on the downstream side of an excavated short-term detention basin to prevent sediments from migrating off LANL property. Excavated soil will be piled and sloped on the western side of the detention basin.	1.1/0.45 0.62/0.25 0.72/0.29
Reinforce Los Alamos Reservoir	Reinforce the existing embankment at the Los Alamos Reservoir by installing an articulated concrete mattress (ACM) over the upstream face top and the downstream embankment of the dam. Build a 300-ft (90-m) long access road downstream of the reservoir.	1.0/0.40 0.07/0.03
Pajarito Canyon Flood Retention Structure	Design and construct a concrete structure in Pajarito Canyon, approximately 2.0 miles (mi) (3.2 kilometers [km]) upstream of TA-18, to retain water and prevent potential downstream flooding at TA-18 and in White Rock. The flood retention structure design specifies the structure to be approximately 70 ft (21 m) above grade and 390 ft (117 m) across the width of Pajarito Canyon. The bottom of the structure will have a 42-inch (in.) (105-centimeter [cm]), non-gated drainage conduit. Normal rainfall amounts will flow through. Accumulations of water shall be retained for no longer than 96 hours and will drain naturally into existing streambeds.	9.2/3.7 2.1/.84 1.38/.55
Reinforce SR 501 Crossing at Pajarito Canyon	Grade and shape the downstream slope of SR 501 and place 6-in. (15-cm) thick shotcrete mattress for a distance of approximately 200 ft (60 m).	<0.5/<0.2
Reinforce SR 501 Crossing at Two Mile Canyon	Grade and shape the downstream slope of SR 501 and place 6-in. (15-cm) thick shotcrete mattress for a distance of approximately 200 ft (60 m). Place reinforcement matting for a distance of approximately 260 ft (78 m) adjacent to the shotcrete mattress.	<0.5/<0.2
Reinforce Anchor Ranch Road Crossing at Two Mile Canyon	Reinforce both the upstream and downstream slopes of Two Mile Canyon at the Anchor Ranch Road land bridge. Construct an emergency spillway to the south of the embankment. Modify the downstream slope to approximately a two-to-one slope.	<1.0/<0.4
Reinforce SR 501 at Water Canyon	Temporarily place six ACMs on filter fabric in severely washed out areas downstream of the embankment slope. Grade and shape the upstream and downstream slopes of SR 501, relocate previously placed ACM from the downstream slope to the upstream slope, and place shotcrete on the downstream slope for a distance of approximately 256 ft (76.8 m).	<1.0/<0.4

The 1999 LANL Site-Wide Environmental Impact Statement (SWEIS) (DOE 1999) described the existing environment of the Los Alamos area; however, the Cerro Grande Fire altered many of the existing conditions both at LANL and in the surrounding area. These effects are only partially known at this time. The SEA summarizes the environmental baseline at LANL and in the surrounding geographic areas of concern, or the region of influence (ROI) as discussed in the 1999 LANL SWEIS, changes that are expected under the Expanded Operations Alternative selected in the SWEIS ROD, and changes as a result of the fire to the extent that they are now known or estimated. The

boundaries of the ROI depend on the resource under consideration. For hydrology, for example, the ROI includes all the watersheds affected by the fire and the Rio Grande to the point where it enters Cochiti Reservoir. The ROI for environmental restoration, in contrast, consists of LANL and the area immediately downstream.

Environmental impacts are described and discussed across the various resource areas that were directly, indirectly, or cumulatively affected by DOE emergency response actions. A sliding-scale approach was employed so that environmental resources are discussed at a level of detail commensurate with the level of impacts. The primary beneficial effects of DOE's suppression activities were that the fire was extinguished, no lives were lost, and property and environmental damage was minimized. The primary beneficial effects of the post-fire activities were to restore LANL to an operating condition quickly, to rehabilitate the burned areas at LANL, and to reduce the risk of damage and protect downstream environment, operations, property, and lives and well-being of workers and residents.

The methodologies used to determine impacts in this SEA differ from typical NEPA documents because of the emergency nature of the actions actually undertaken by or on behalf of DOE. For the most part, impacts are based on events or activities that have already occurred rather than on planned or proposed actions. For example, the acreage affected by constructing the flood retention structure in Pajarito Canyon (10 ac [4 ha]) is not an estimate but the actual area disturbed. Therefore, impacts to certain resources such as the Pajarito Canyon floodplain, have already occurred and are simply reported as fact in their appropriate sections. However, the potential impact of this disturbance on other media, such as biological resources, is estimated based upon many variables in addition to habitat disturbance.

In this SEA, impacts are addressed as occurring from activities either during the fire suppression or the post-fire time period. Short-term impacts are defined as those occurring within the next five years; long-term impacts are those occurring beyond this five-year period. Furthermore, impacts are addressed as either occurring across the entire facility or within defined watersheds at LANL. The major contributors to impacts during the fire suppression were fire road or firebreak construction and tree cutting. The major contributor to impacts during the post-fire period was the construction or modification of various flood control structures, contaminated sediment removal, and demolition actions taken in certain canyon areas at or near LANL. In general, DOE actions had localized or limited individual adverse impacts and were designed to protect life and property from the effects of the fire and subsequent soil erosion and surface water runoff caused by seasonally heavy rainfalls. In this respect, the actions had a significant beneficial cumulative impact at LANL and within the ROIs for most resources.

The actions covered in this SEA encompass a wide range of activities. The individual projects had some adverse effects, such as loss of habitat for wildlife, primarily resulting from soil and vegetation removal. The beneficial impacts however, include protection of cultural resources, substantial areas of floodplains and wetlands, and government, tribal, and private property. Table S.2 summarizes the effects of the fire suppression and post-fire activities.

TABLE S.2—*Summary of Impacts*

Resources	Fire Suppression	Post-Fire
Land Use	No long-term changes in land use as a result of this effort. Short-term reduction in trees within LANL buffer areas. Temporary expansion of TA-49 Cache Facility for firefighters and support crews.	No long-term changes as a result of this effort. Additional removal of trees by LANL. Certain recreation trails within LANL remain closed until cleanup and flood mitigation areas are complete and vegetation is reestablished.
Geology/Soils	None of the fire suppression activities included actions that could significantly affect the local geology. Activities included construction, firebreaks, access roads, and staging areas, backfires and slurry drops that exposed mineral soil and increased the likelihood of soil erosion.	None of the post-fire activities included actions that could significantly affect the local geology of these activities, only the soil stabilization treatments are intensive or extensive enough to significantly cause soil erosion. However, the expected result of the watershed treatments is to stabilize soils and reduce surface runoff.
Water Resources	No major effects on water or surface water quality is anticipated as a result of fire suppression activities. The fire-retardant slurry used was an ammonium polyphosphate solution. Ammonium and sodium ferrocyanide can be toxic to aquatic organisms if applied to surface waters. Perennial surface water areas of Los Alamos did not burn and are not known to have received slurry drops.	No significant adverse effects to the quality or quantity of surface water or perched groundwater or springs are anticipated from post-fire actions. These actions are designed to control water flow and hold back sediment and debris. Flood retention structures that temporarily retain and then slowly release water could lead to increased short-term groundwater recharge in some locations.
Floodplains and Wetlands	Fire suppression activities had a small adverse effect on floodplains where ground-disturbing activity occurred. No fire roads or firebreaks were in wetlands, so no wetlands were affected by fire suppression activities.	The construction of seven major and numerous minor storm water control projects resulted in approximately 20 ac (8 ha) of floodplains being directly disturbed or permanently altered. These controls will protect downstream floodplains and wetlands from erosion.
Biological Resources	The fire suppression activities resulted in transient and long-term effects to biological resources. The clearing of about 130 ac (52 ha) temporarily displaced local wildlife. Use of the affected area by some bird species may be expected to decline on a local basis while other species would remain unchanged.	Post-fire activities produced an array of biological effects. In general, protection of potential threatened and endangered (T&E) species habitat from flood damage will be beneficial for T&E species and other species. However, destruction of Mexican spotted owl core nesting and roosting habitats will have a minimal long-term adverse effect.
Climatology, Meteorology, and Air Quality	The use of equipment for fire suppression activities produced criteria air pollution emissions. Because of the closure of LANL and the townsite, these emissions were roughly 20 percent to 80 percent of typical LANL vehicle traffic for a two-week period—which is a negligible adverse effect.	The adverse effects on air quality from construction activities and contaminant disturbance and removal were of short duration. Doses to the nearest offsite receptor from airborne radioactive emissions associated with work in the PRSs were estimated not to exceed 0.1 millirem.
Visual Resources	The principal effect on visual resources from fire suppression activities was the cutting of firebreaks and fire roads. This is a temporary adverse effect to visual resources at LANL.	The various construction activities had minor adverse effects on visual resources. There was short-term increased suspended particulate matter, new structures in previous minimally disturbed areas, and deposition of black sediment where runoff accumulates behind storm water control structures.

TABLE S.2—*Continued*

Resources	Fire Suppression	Post-Fire
Cultural Resources	The leveling of a staging area in TA-49 destroyed one and damaged two other cultural resource sites. Although this is considered an adverse effect, these three sites constitute less than one percent of the total LANL archaeological sites.	Post-fire activities resulted in adverse impacts to two significant historic structures at TA-02. Although UC cultural resource specialists documented the buildings before they were dismantled, the removal of the buildings is considered an adverse impact. Post-fire activities also created a beneficial impact by reducing the likelihood that other cultural properties would be adversely affected by erosion.
Utilities and Infrastructure	The fire suppression activities had a temporary beneficial effect on water, gas, and electric utilities at LANL by minimizing damage from the fire. About 30 mi (48.3 km) of new or upgraded access roads were bladed, although most of the these were of temporary nature so effects were also temporary.	Beneficial impacts occurred from the installation of flood control and flood retention structures. Major benefits include improved access, maintenance, and protection from damage to both utilities and infrastructure at LANL.
Socioeconomics	No substantial changes to either the local or regional populations or economics are expected as a result of fire suppression activities.	No substantial changes to either the local or regional populations or economics are expected as a result of post-fire mitigation activities.
Noise	Actions authorized by DOE during the fire suppression period had a minimal effect on the types of noise and the typical noise levels found at or in the vicinity of LANL. These activities were temporary and during the period when LANL and the townsite were evacuated.	The types of noise from post-fire response actions were typical of on-going construction activities and maintenance operations routinely performed at LANL. Noise levels increased in and around LANL during this period.
Environmental Justice	The fire suppression activities had no disproportionately high and adverse human health on environmental effects on minority and low-income populations.	Post-fire activities will have a positive effect on environmental justice issues as the risk of soil erosion and flood damages are significantly reduced to downstream communities.
Human Health	Fire suppression activities had a minimal to moderate adverse effect on emergency response workers health due to exposure to smoke and fire, firefighting hazards, and exposure to chemicals used. A potentially significant benefit to public health was the prevention of further spread of the fire to additional residential areas.	Effects on worker health that resulted from post-fire activities were less than or similar to those that occurred during the fire suppression period. Workers were not exposed to fire and smoke, but continued to be exposed to other hazards, such as the removal of vegetation, construction activities, helicopter, and vehicle traffic. There was one reported worker injury from a fall associated with managing inventories for aerial seeding operations. The worker is expected to fully recover.
Environmental Restoration and Waste Management	There were no effects (due to no activity) on environmental restoration and risk management from fire suppression activities.	BMPs for 91 PRSs affected by the fire were completed. As of July 21, 2000, 47 accelerated actions were either in progress or had been completed. DOE actions taken during this period resulted in the generation of additional low-level radioactive waste sent to TA-54 and nonhazardous solid waste sent to approved landfill sites.

TABLE S.2—*Continued*

Resources	Fire Suppression	Post-Fire
Transportation	Effects on both the regional and internal LANL transportation system as a result of fire suppression were minimal. Some limited-period road closures were necessary during this period to prevent access to LANL and to adjacent communities for safety and security purposes.	Effects on both the regional and internal LANL transportation system were minimal. Some limited-period road closures were necessary during this period to support repair work and replacement of culverts, delivery of construction material, and to allow for movement of hazardous material.

DOE and UC maintain regulatory compliance with environmental laws and regulations as an integrated element of conducting work at LANL. The processes used during the response to the Cerro Grande Fire have continued to ensure compliance and improve the relationships with the regulatory and consulting agencies. Because emergency actions needed to be implemented immediately, DOE and UC initiated emergency permit processes and consultations under appropriate regulations. DOE, UC, and USACE entered into a memorandum of understanding to ensure that all parties maintained environmental compliance during the emergency. Routine compliance processes will continue for non-emergency actions and will be the only compliance processes conducted after actions taken under emergency permits and consultations are completed before or by November 30, 2000.

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